

Analysis of the Effect of pH on Poly(vinyl phenol).

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Poly(vinyl phenol) reacted with an acid chloride, can produce transparent coatings of interest for ICF targets. To be truly useful, however, the coatings need to be optimized for surface finish and controlled wall thickness. This requires an understanding of the PVP molecule and a model of film formation. One of the curiosities of the reaction is the narrow pH range (12.6 to 13.1) of the aqueous phase that produces effective film growth. We report here on our investigations into the changes in behavior for PVP solutions at the pH range of interest and our interpretation of the significance of those effects for film formation. First noted was a change in miscibility between the aqueous PVP phase and the organic phase. PVP solutions of pH 12.6 and 13.1 were shaken in a separatory funnel with organic solvent. The pH 13.1 solution separated cleanly within an hour, the pH 12.6 solution required overnight to achieve the same separation. Both organic solutions became colored, indicating transport of PVP in the organic phase. Intrinsic viscosity measurements were made of 4% PVP solutions in amyl acetate (low hydrogen bonding solvent), methanol (high hydrogen bonding solvent) and aqueous solutions of pH 12.7, 13.0, and 13.4. Steady increases in intrinsic viscosity were seen throughout the series. Titrations of the PVP solution were done with NaOH, beginning with solutions of pH 12.4. Results indicated a pK_a between 12.4 and 13.3. This result suggests that the PVP molecule is only partially deprotonation even at a pH of 12.6. Thus the molecule maintains solubility in organic solvents, enabling it to enter the organic phase and react with the acid chloride. At a pH more basic than 13.1, the molecule becomes deprotonated to the extent that solubility is reduced and significant reaction does not occur.

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